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10:1 Passive Probe
PM8929

Instruction Manual

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1. INTRODUCTION

The PM 8929-series is a 10x attenuator modular probe, designed for oscilloscopes with probe indication feature.
Depending of the probe version, three different types are available:

- PM 8929/19, with a cable length of 1 m.
- PM 8929/09, with a cable length of 1,5 m.
- PM 8929/29, with a cable length of 2,5 m.

The probes consist of 3 separate units:

- The compensation box having a BNC male connector output, with automatic range indication possibility.
- The cable assembly.
- The probe body including probe tip and RC assy.

If the oscilloscope is provided with automatic range indication possibility, the attenuator range is selected by a resistor which is mounted in the holder of the BNC connector and advances the V/DIV reading by 10x.

At delivery the probe has been adjusted to an oscilloscope with an input capacitance of 9 pF.

2. CHARACTERISTICS

- Properties expressed in numerical values with tolerances stated, are guaranteeed by the manufacturer.
- Numerical values without tolerances are typical and represent the characteristics of an average probe.

2.1. Electrical

NOTE: These characteristics are valid with a termination of 1 MΩ oscilloscope input, unless otherwise stated.

designation	specification	additional information
Attenuation (d.c.)	10x + or −2 %	
Input impedance		
− Parallel resistance		
at d.c.	10 MΩ + or −1.5 %	
at a.c.	see fig. 1.	
− Parallel capacitance	12 pF	for PM 8929/19
up to 100 kHz.	13,5 pF	for PM 8929/09
	16,5 pF	for PM 8929/29
		(for parallel capacitance as function of frequency, see fig. 1.).
Compensation range		
− Input capacitance of oscilloscope	5 pF ... 20 pF	
Bandwidth		
− Probe only bandwidth as osc. input cap. 10 pF or less	d.c. ... 500 MHz (−3 dB)	PM 8929/19
	d.c. ... 450 MHz (−3 dB)	PM 8929/09
	d.c. ... 400 MHz (−3 dB)	PM 8929/29

designation	specification	additional information
> 10 pF	d.c. ... 400 MHz (–3 dB) d.c. ... 300 MHz (–3 dB) d.c. ... 250 MHz (–3 dB)	PM 8929/19 PM 8929/09 PM 8929/29
– Max. useful system bandwidth at osc. input cap. or 10 pF	d.c. ... 350 MHz (–3 dB) d.c. ... 300 MHz (–3 dB) d.c. ... 250 MHz (–3 dB)	PM 8929/19 PM 8929/09 PM 8929/29
		NOTE: Up to these freq. the system (probe + scope) bandwidth is ⩾ 95 % of the "scope only bandwidth.
Pulse response		Aberrations in addition to osc. aberrations. Oscilloscope bandwidth ⩽ usuful bandwidth.
– Overshoot	< 6 %	
– Ringing during first 30 ns after leading edge	+ or – 5 %, or 7 % pk-pk	
– Ringing thereafter	+ or –2 %	
– Tilt	⩽ 2 %	
Signal delay	5,2 ns + or –150 ps 7,6 ns + or –200 ps 12,3 ns + or –300 ps	for PM 8929/19 for PM 8929/09 for PM 8929/29 Measured between tip to BNC-output connector.

Maximum voltage

– Max. non destructive input voltage (d.c. + a.c. peak)	500 V	0 ... 2 MHz approx. for derating see fig. 2.
– Test voltage (d.c.):		
type test	2,42 kV	During 1 min (resistance value adapted to test)
performance check	2,42 kV	During 1 sec.

2.2. Mechanical

– Dimensions	length	width	height	
probe body	57 mm	14 mm	(max)	
cable assy	1000 mm	9 mm	(max)	for PM 8929/19
	1500 mm	9 mm	(max)	for PM 8929/09
	2500 mm	9 mm	(max)	for PM 8929/29
compensation box	38 mm	16 mm	15 mm	BNC excluded
pouch	275 mm	195 mm		

– Mass	143 g	for PM 8929/19
	151 g	for PM 8929/09
	167 g	for PM 8929/29
		Standard probe with accessories in pouch.

2.3. Environmental

The characteristics are valid only if the instrument is checked in accordance with the official checking procedure. Details on these procedures and failure criteria are supplied on request by the PHILIPS-organisation in your country, or by PHILIPS, INDUSTRIAL AND ELECTRO-ACOUSTIC SYSTEMS DIVISION, EINDHOVEN, THE NETHERLANDS.

– Operating temperature	$-10^{o}C$ ... $+55^{o}C$
– Storage temperature	$-62^{o}C$ ... $+85^{o}C$
– Maximum humidity	95 % relative humidity
– Altitude * operating	To 4500 m
* non-operating	To 12000 m
– Vibration (operating)	
* freq. 5 ... 15 Hz	7 min each axis, excursion 1,5 mm (p-p) and 7 m/s^2 (0,7 g) acceleration at 15 Hz.
* freq. 15 ... 25 Hz	3 min each axis, excursion 1 mm (p-p) and 13 m/s^2 (1,3 g) acceleration at 25 Hz.
* freq. 25 ... 55 Hz	5 min each axis, excursion 0,5 mm (p-p) and 30 m/s^2 (3 g) acceleration at 55 Hz.
– Resonance dwell	10 min at each resonance freq.
– Shock (operating)	300 m/s^2 (30 g), half sine-wave shock, duration is 11 ms. (3 shocks per direction for a total of 18 shocks).

2.4. Accessories

– Accessory kit, contents:
  - Earth cable
  - Spring-loaded test clip
  - Set marking rings
  - Probe tip (2x)
  - Insulating cap
  - DIL cap
  - Wrap pin adapter
  - Earth bus

– Instruction manual

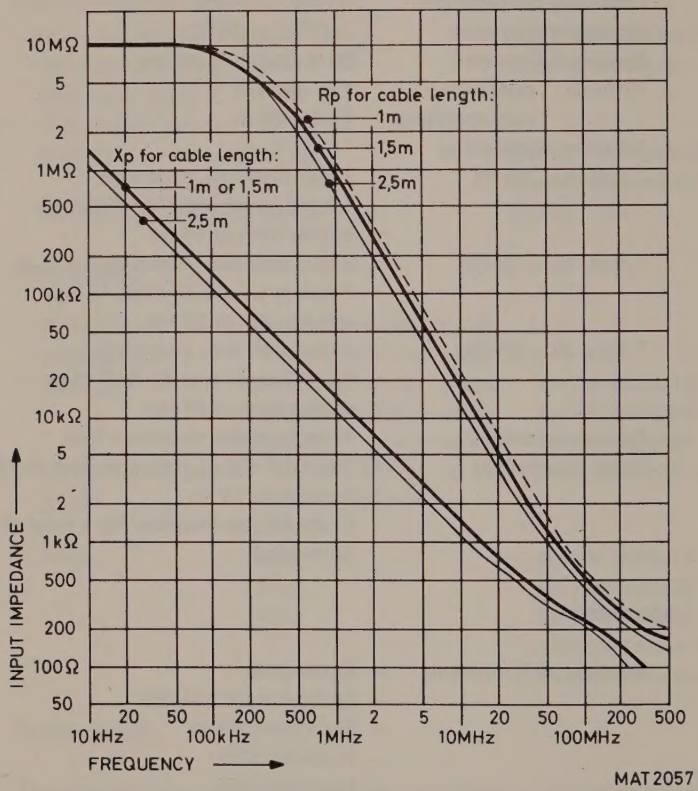

Fig. 1. Input impedance v.s. Frequency

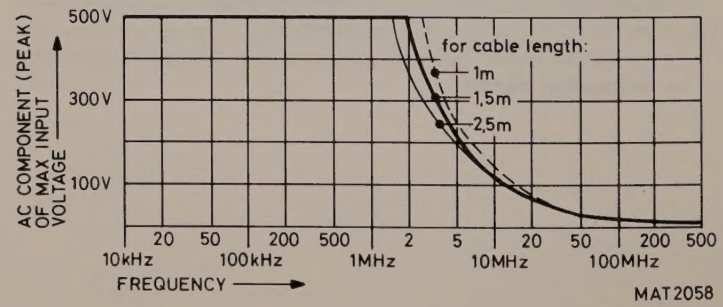

Fig. 2. AC component (pk) of max. input voltage v.s. Frequency

3. DESCRIPTION OF ACCESSORIES

Earth cable: To minimize ringing in a signal, an earth cable is provided. This cable must **first** be plugged onto the probe body and then be connected to the nearest earth point of the circuit to be measured.

Spring-loaded test clip: This is a provision for hands-free connection to a test point or component lead.

Marking rings: At delivery a set of 3 different colour marking rings (red, white and blue) are provided. This can be used to help identify the specific probes when using more than one probe on an oscilloscope.

Probe tip: A spare set of 2 probe tips are standard supplied with the probe. When a probe tip is damaged it can be pulled out by means of a pair of pliers. Then a new tip must be firmly pushed in.

Insulating cap: An insulating cap is provided to cover the metal part of the probe during measurements in densely wired circuits.

D.I.L. cap: This is a cap facilitating measurements on dual-on-line integrated circuits.

Wrap pin adapter: The wrap pin adapter is a provision to make hands-free connection to a wired wrap pin circuit.

Earth bus: This is a provision to minimize ringing in VHF signals, when earthing must be as short as possible.

4. DISMANTLING

WARNING: The probe shall be disconnected from all voltage sources before any unit separation, replacement or maintenance will be carried out.

4.1. Dismantling the probe body

The probe body can be removed by sliding the probe body from the cable assembly.

4.2. Dismantling the compensation box

- Unscrew the knurled nut in a counter-clockwise direction.
- Remove the compensation box by sliding it from the cable assy.
- Slid the cap sideways off the compensation box.
- The h.f. adjustment controls are then accessible.

WARNING: If adjustment of the h.f. controls is inevitable, it must be carried out only by a qualified person who is aware of the hazards involved.

5. ADJUSTMENTS

5.1. Matching the probe to your oscilloscope

The measuring probe has been adjusted and checked by the manufacturer. However, to match the probe to your oscilloscope, the following manupilation is necessary.

- Connect the measuring pin to the CAL-socket of the oscilloscope.
- A trimmer can be adjusted through a hole in the compensation box to obtain optimum square-wave response, see Fig. 3, 4 and 5.

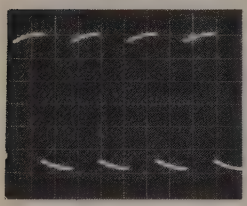

Fig. 3.
Over-compensation

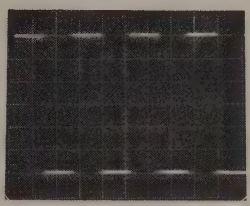

Fig. 4.
Correct compensation

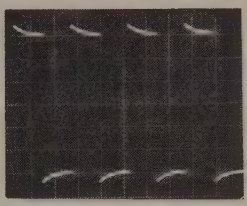

Fig. 5.
Under-compensation

5.2. Adjusting the h.f. step response

WARNING: If adjustments of the h.f. controls is inevitable, it must be carried out only by a qualified person who is aware of the hazards involved.

The h.f. step response correction network has been adjusted by the manufacturer to match the oscilloscope input. For optimum pulse response, for separate delivered probes, the probe can be adjusted to match your particular oscilloscope.

Later readjustment is only necessary:

- If the probe is to be used with a different type of oscilloscope.
- After replacement of a separate unit or an electrical component.

For adjustment, proceed as follows:

- Dismantle the compensation box, see Section 4.2.
- Connect the probe to a fast pulse generator (rise-time not exceeding 1 ns) which is terminated by its characteristic impedance.
- Adjust the generator for a 6 div/100 kHz pulse.
- Set all potentiometers fully clockwise and both trimmers C2 and C4 for minimum capacity.
- Adjust the adjusting elements according to fig. 7.

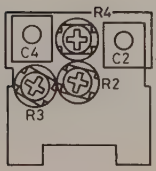

Fig. 6. Adjusting elements

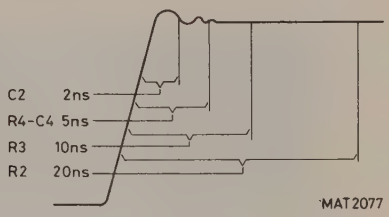

Fig. 7. Adjusting elements v.s. h.f. step response

6. PARTS LIST

For ease of handling some spare parts are delivered in larger quantities as a set.

Item	Q.ty	Ordering number	Description	Probe PM 8929/.. 19	09	29
1	1	5322 264 20062	Probe body	x		
	1	5322 264 20056			x	
	1	5322 264 20061				x
2	1	5322 321 21224	Cable assy-1 m	x		
	1	5322 321 21113	Cable assy-1,5 m		x	
	1	5322 321 21171	Cable assy-2,5 m			x
3	1	5322 219 80647	Compensation box	x		
	1	5322 219 80646			x	
	1	5322 216 92317				x
4	1	5322 321 20223	Earth cable	x	x	x
5	1	5322 264 24019	Spring-loaded test clip	x	x	x
6	1	5322 310 30624	Set of probe tips	x	x	x
7	6	5322 310 30623	Set of insulating cap	x	x	x
8	6	5322 310 30626	Set of DIL cap	x	x	x
9	4	5322 310 30627	Set of WRAP-pin adapter	x	x	x
10	6	5322 267 10043	Set of earth bus.	x	x	x

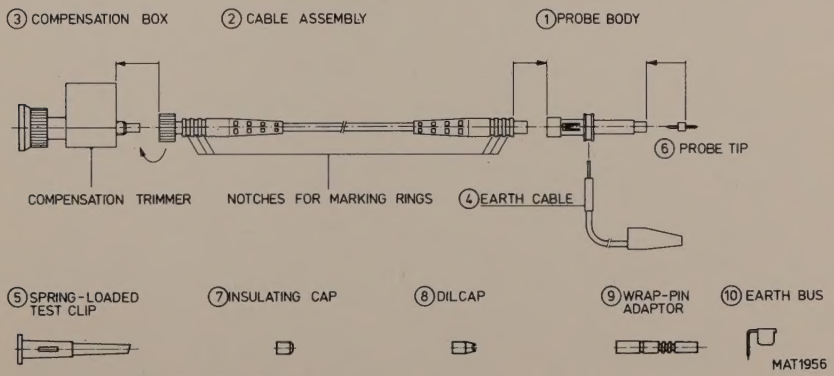

Fig. 8. Probe with accessories